REMARKS

In response to the Office Action dated May 28, 2004, Applicants respectfully request reconsideration and withdrawal of the rejections of the claims. The courteous interview conducted by Examiner Thompson with Applicants' undersigned representative is noted with appreciation. The substance of that interview is set forth in the following remarks.

Claim 9 was objected to on the grounds that, in the version of the claim presented in the response filed February 17, 2004, the superscript k was improperly depicted. In response thereto, claim 9 is being re-presented herein. Since this version of the claim corresponds to the claim as originally presented in the application, it is labeled as "Original". In other words, the typographical error that appeared in the previous response was not an intentional amendment on the part of the Applicants. The Examiner is thanked for pointing out this error.

Claim 3 has been amended to depend from claim 2, to provide antecedent support for the recitation of "said significance coefficient."

Claims 1-9 and 11-22 were rejected under the first paragraph of 35 U.S.C. § 112, on the grounds that the specification does not provide an enabling disclosure of the claimed subject matter. For the reasons presented hereinafter, and discussed during the above-noted interview, it is respectfully submitted that the application meets the standards for compliance with the statute.

The claimed invention is directed to the enhancement of images on a pixel-by-pixel basis. As described in the background portion of the application, one exemplary application of the invention is a process known as "inverse half toning", in which binary pixel values for an image are converted into values within a continuous range, e.g. 0-255. Preferably, this method is carried out in an iterative fashion, in

which a pixel value resulting from one iteration is updated in a successive iteration. (Page 3, lines 18-25). The updating that occurs during each iteration is succinctly described by the equation set forth on page 6, line 28 of the application. Thus, in order to make and use the invention, a person need only know how to program a computer to implement this equation. Since the equation merely involves arithmetic calculations, such programming is well within the capability of those having only the most basic level of skill in the art. It is not seen where any undue experimentation would be required to perform this task.

Of course, the execution of the equation requires the prior calculation of the weighting value a_{ij}. However, the application explicitly describes this calculation as well, as can be seen by the equations appearing on page 7 of the application. This equation, in turn, requires the calculation of two values, namely f(v) and w(i,j). Again, however, the application provides specific examples of these values. With respect to the baseline value w(i,j), page 7, lines 11-12 disclose that this value could be the same as the value y(i,j) of the pixel being updated. The specification goes on to disclose that, more preferably, the baseline value is a function of y(i,j) in which high frequency components are reduced, "such as an average over the pixels neighboring (i,j)." (Page 7, lines 12-14). These are not "vague possibilities" as alleged in the Office Action. Rather, the application clearly discloses that the baseline value can be calculated by determining the average value of pixels within a neighborhood. Figures 4a-4c depict three specific examples of neighborhood functions that can be employed. Thus, no experimentation is required to obtain the baseline value w(i,j). One need only follow the example that is explicitly set forth in the specification.

Similarly, the application sets forth four specific examples for the function f(v), at page 13, lines 3-10. Furthermore, in Tables 5-7 appearing on pages 13-16, the application provides specific results that are obtained with each of these different functions, for each of the three different neighborhood functions of Figures 4a-4c, and different values for the parameter "k". By virtue of this disclosure, a person of ordinary skill in the art is provided with more than enough information to determine, for a given iteration, which of the four possible functions and three disclosed neighborhoods is the most appropriate for any desired effect to be achieved.

In view of the foregoing, it is respectfully submitted that the specification provides sufficient information for a person of ordinary skill in the art to make and use the invention without requiring *any* experimentation on the part of that person. The only skill that is required is the ability to program a computer to perform arithmetic calculations, all of which are explicitly set forth in the specification. Reconsideration and withdrawal of the rejection is therefore respectfully requested.

Claims 1-5 and 11-22 were rejected under 35 U.S.C. § 102, on the grounds that they were considered to be anticipated by the Wong patent (U.S. 5,506,699). Claims 6-9 were rejected under 35 U.S.C. § 103, as being unpatentable over the Wong patent.

Claim 1 recites a method for converting a halftone image into a continuous-valued image that includes the initial step of, for each pixel, defining a neighborhood that contains that pixel and other pixels. The claim further recites the steps of obtaining a continuous value for each individual pixel "by summing the products of weighting values and the ... values of the pixels in the neighborhood of the individual pixel." During the initial iteration, the pixel values are the binary halftone values, and in subsequent iterations the pixel values are the continuous values obtained from a

previous iteration. In an exemplary embodiment of the invention, this claimed step is implemented with the equation depicted on page 6, line 28. As can be seen therein, a weighting value $a_{ij}(k,l)$ is multiplied by the value of a pixel in the neighborhood, $y(i+k, j+l)$. This product is computed for each pixel in the neighborhood, i.e., over all of the values for k and l, and these computed products for the neighborhood are summed.

It is respectfully submitted that the Wong patent does not disclose, nor otherwise suggest, the computation of products of the type recited in the claim, nor the summing of such products. Rather, the Wong patent employs an entirely different approach for inverse half toning. Referring to the disclosure that begins at column 5, line 25, a neighborhood $R_{m,n}$ is defined, and the mean value $\mu_{m,n}$ of all the pixels in the neighborhood is computed. Another value, $v_{m,n}$, is computed that indicates the amount of variation among the pixels within the neighborhood. As explained at column 5, lines 62-64, this value is analogous to the standard deviation of the pixels in the neighborhood.

After these two values have been computed, two thresholds are established. An upper threshold is defined as $\mu_{m,n}+\gamma v_{m,n}$ and a lower threshold is defined as $\mu_{m,n}-\gamma v_{m,n}$, where γ is a multiplier in the range of 0-1.

Once these thresholds have been established, the value of the pixel of interest is compared to them. As indicated by the algorithm depicted at column 5, lines 39-43, if the pixel value is greater than the upper threshold, its new value is set equal to the upper threshold value. Conversely, if the pixel's value is less than the lower threshold, its new value is set equal to the lower threshold. Otherwise, if the pixel lies between the upper and lower threshold limits, its value remains unchanged.

See the summary of this procedure in the paragraph appearing in column 6, lines 1-9.

From the foregoing, it can be appreciated that the Wong patent does not disclose the method recited in claim 1. For instance, it does not disclose the computation of the product of a weighting value and the value of pixels in the neighborhood. There is no disclosure of multiplying a pixel value $x_{m,n}$ with any other factor. Rather, the patent only discloses that the value of a pixel is compared to the upper and lower thresholds, and adjusted up or down if it exceeds one of the thresholds.

Furthermore, since the Wong patent does not disclose the computation of such products, it cannot disclose the further step of summing these products for all of the pixels in the neighborhood.

Each of the other independent claims recites the concepts of computing the products of a value relating to each pixel in a neighborhood and another factor, such as a weighting value or a significance coefficient, and summing these products over the neighborhood. Since the Wong patent does not disclose these concepts, it is respectfully submitted that it cannot be interpreted to anticipate any of the pending claims. Reconsideration and withdrawal of the rejection is therefore submitted to be in order, on at least the basis of this distinction.

Claim 2 recites the step of deriving a significance coefficient for *each* pixel of the neighborhood. The significance coefficient for a pixel is multiplied with the image value of that pixel, to form one of the products that is summed. As further defined in claim 3, the significance coefficient for a pixel is an indication of the likelihood that the value of that pixel is correlated with the value of the individual pixel, i.e. the pixel being updated.

The Office Action states that it is not readily apparent that the term "significance coefficient" refers to the variable $a_{ij}^{m+1}(k,l)$. Applicants would like to first point out that the term "significance cofefficient" is not limited to this particular variable. However, upon reading the disclosure, one of ordinary skill in the art would understand that the variable a_{ij} is one embodiment of a significance coefficient. More particularly, in the sentence bridging pages 3 and 4 of the specification, the significance coefficient is described as "an indication of the likelihood that the value of a neighborhood pixel in the image...is correlated with the value of the individual pixel in the original image." Later, at page 7, lines 16-17, the specification explains that the difference between $y^m(i+k, j+l)$ and w^m is a measure of the likelihood that the pixel value at (i+k, j+l) is uncorrelated with the pixel value at (i,j). Since the parameter $a_{ij}^{m+1}(k,l)$ is defined as a function of this difference, it is believed to be apparent that this parameter constitutes one example of a significance coefficient.

Turning now to the rejection of claim 2, the Office Action states that the Wong patent discloses a significance coefficient, with reference to the definition of $\mu_{m,n}$ that appears in column 5, lines 51-55. It is respectfully submitted that this term does not constitute a significance coefficient for *each* pixel of a neighborhood, as recited in claim 2. Rather, as discussed previously, this term describes the amount of variation among the pixels within the neighborhood. In other words, it is a *single* value that applies to the neighborhood as a whole, rather than being a value that is derived for *each* pixel in the neighborhood. Since it applies to the neighborhood as a whole, it cannot provide the type of information recited in claim 3, namely the likelihood that the value of a given pixel in the neighborhood is correlated with the pixel of interest, i.e. $x_{m,n}$.

For these additional reasons, therefore, it is respectfully submitted that the *Wong* patent does not anticipate the subject matter of claims 2, 13, 14, 16 or 17, nor any of their dependent claims.

Reconsideration and withdrawal of the rejections, and allowance of all pending claims are respectfully requested.

Respectfully submitted,

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